

北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

The fascinating properties of nanocavity plasmon

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Time: 4:00pm, Dec. 21, 2016 (Wednesday)

时间: 2016年12月21日 (周三)下午4:00

Venue: Room w563, Physics building, Peking University

地点:北京大学物理楼,西563会议室

Abstract

A metallic nanocavity can squeeze the visible light into highly confined intensive nanocavity plasmon (NCP) with a broad energy distribution. Such a unique excitation source can lead to many exciting new applications. I will present here our several new exciting findings from the use of NCP. Our combined theoretical and experimental studies reveal that the NCP acts like a tunable, strong and ultra-fast electromagnetic source that can naturally alter the color of the emission of a molecule[1,2]. The amplified light emission of the molecule enables us to image the coherent dipole-dipole interaction between molecules[3]. Moreover, we predicted and verified that the NCP can also produce a completely new physical process, namely the nonlinear inelastic electron scattering[4]. A new theory that takes into account the locality of the highly confined field to describe the light-matter interaction has been developed[4], which has successfully reproduced experimentally observed super high spatial resolution Raman images of a molecule, below one nanometer [5]. It is found that the non-resonant Raman images should be capable of revealing the vibrational modes of the molecule in real space[4b]. The breakdown of the dipole and spin selection rules for molecular excitations will also be discussed.

References:

- 1. Z.C. Dong, et al. Nature Photonics, 4 (2010) 50
- 2. G.J. Tian, et al., Phys. Rev. Lett., 106 (2011) 177401; G.J. Tian, et al., Angew. Chem. Int. Ed., 52 (2013) 4814
- 3. Y. Zhang, et al., Nature, 531 (2016) 623
- 4. C.K. Xu, et al. Nature Physics, 10 (2014) 753.
- 5. S. Duan, et al., J. Am. Chem. Soc., 137(2015) 9515; S. Duan, et al., Angew. Chem. Int. Ed., 128 (2016) 1053.
- 6. R. Zhang, et al. Nature, 498 (2013) 82; S. Jiang, et al. Nature Nanotechnology, 10, (2015) 865

About the speaker

罗毅,男,中国科学技术大学教授、博士生导师,现任合肥微尺度物质科学国家实验室常务副主任;首批"千人计划"入选者(2008)和国家特聘专家,国家杰出青年基金获得者(2009),国家重大科学研究计划项目(973)首席科学家(2010-2014)。1996年获瑞典林雪平大学计算物理博士学位。1997—2000年在瑞典斯德哥尔摩大学任助理教授。 2000年3月至今任瑞典皇家理工学院副教授、教授和兼职教授。由于在分子、纳米、生物光子学与电子学以及X射线科学等方面所作出的显著贡献,获得2010年瑞典皇家科学院"Goran Gustafsson"化学奖,2014年作为主要完成人之一获中国科学院"杰出科技成就集体奖"。在Nature, Nature 子刊, PNAS, PRL, JACS等国际学术期刊发表论文390多篇,被引一万多次,H因子51。

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